GRAND CANYON NATIONAL PARK NIGHT SKY PROTECTION AND EXTERIOR LIGHTING POLICY (01/04)

I. Purpose

A. The dark night skies over the Grand Canyon provide a source of enjoyment and wonder for both visitors and residents. They have historically been an essential part of the visitor experience. The purpose of this policy is to ensure that the skies over Grand Canyon National Park remain dark for future generations to enjoy.

B. It is the intent of this policy to require lighting practices and systems which will minimize light pollution and conserve energy while maintaining safety.

II. Applicability

A. This policy is applicable for the installation of any and all new exterior lighting within Grand Canyon National Park, except as listed below.

1. The following light sources are exempt from the provisions of this policy.

A) Isolated light sources under 50 watts.

B) Emergency lighting by police, fire and other authorities.

C) Lighting required in FAA regulations for the safe operation of helicopters and other airships. Consult with Grand Canyon National Park for means of mitigating light pollution and glare.

D) Holiday lighting.

E) Temporary construction lighting. Consult with Grand Canyon National Park for means of mitigating light pollution and glare.

B. The replacement or retrofitting of existing lighting in order to meet the provisions of this policy is strongly encouraged, but is not immediately required unless specifically called for by the Superintendent.

The Park, Concessioners, and other entities within the Park should inventory and examine existing exterior lighting sources to determine which of them do not meet the provisions of this policy, and should implement a program to retrofit or replace lighting as necessary.

Contact Grand Canyon National Park for information related to determining whether existing lighting meets this policy, and for information related to retrofitting or replacing existing lighting.

C. Communities outside the Park are beyond the jurisdiction of this policy, but they are encouraged to adopt this or similar policies to control light pollution, and to

seek information from the Park and others concerning exterior lighting. Refer also to the informational sources discussed elsewhere in this document.

D. This policy provides guidelines for the installation of lighting, but is not intended to specify where illumination is required. For example, a limit on illumination levels for roadways does not imply which roadways should be illuminated.

In general lighting should be installed only where necessary for public safety, or to illuminate necessary informational signs and displays, as recommended by the designer and approved by the Park.

In deciding where lighting should be installed, it is important to consider that the lighting will be in a National Park, where public expectations for illumination, as well as traditional practices for lighting, may be different from those of an urban environment.

E. This policy is intended to apply to exterior lighting only.

III. Shielding

A. All light fixtures shall at a minimum be fully shielded to provide full cutoff. A fully shielded fixture is defined as one which allows no light from either the lamp or fixture to be projected above the horizontal.

The light pattern from fixtures shall be further restricted (to the extent practical) so that light is directed onto only those areas that require illumination.

B. Lights near the canyon rim shall have additional shielding to prevent light from being directed into the canyon.

C. Signs and displays shall be lit from above with fully shielded lighting.

D. Light sources which do not meet the above requirements and are prohibited include:

1. Floodlights.

2. Ornamental luminaires (with visible light sources).

IV. Illumination

A. As noted above, this policy provides limits on illumination levels but is not intended to specify where illumination is required.

B. Illumination Levels for Roads, Parking, Pathways, Bikeways, and other improvements.

1. Follow the minimum recommended illumination levels of the IES (Illuminating Engineering Society of America.) Refer to Table 1 below for "Guidelines for Levels of Illumination Based on IES Recommendations,

Grand Canyon National Park". Designers should consult the IES Lighting Handbook for additional information. If the table does not apply to a particular condition, provide an alternate recommendation for review and approval by Grand Canyon National Park. Illumination levels may be set higher than the standards given only if warranted by safety considerations, as recommended by the designers and approved by the Park.

2. The overall illumination for any area shall not exceed 25,000 lumens per acre averaged over the entire area.

3. Area lighting designs shall include computer printouts of projected illumination levels, demonstrating compliance with this policy.

   If designers believe that a particular design condition does not allow the illumination level guidelines of this policy to be met, provide alternative recommendations (for review and approval by Grand Canyon National Park) that will minimize illumination levels.

C. Illumination for athletic events and recreation shall follow IES recommendations. All athletic and recreational events shall be scheduled for completion by 8:45 p.m., and lighting shall be turned off by 9:00 p.m. unless the event carries beyond its originally scheduled time of completion.

D. Note that 1 footcandle = 1 lumen/sq. ft. 1 acre = 43,560 sq. ft., so that 1,000 lumens/acre = 0.0230 footcandles.

V. Lamps

A. Lamps shall be chosen for energy efficiency.

B. In areas where color rendition is not an issue, the preferred lamp type is Low Pressure Sodium (LPS), which has the advantages of highest efficiency and immediate restrike. It also provides light that can be easily filtered out by astronomical observatories.

C. In areas where a moderate level of color rendition is needed, Grand Canyon National Park Maintenance has standardized the use of High Pressure Sodium (HPS). Most parking areas that require lighting would be included in this category.

D. In areas where a high level color rendition is important (as for signs and displays), other lamp types may be used, provided the fixture is properly shielded and meets other requirements of this document.

E. Mercury vapor lamps are prohibited.

VI. Appearance of Fixtures

A. Appearance of fixtures for site lighting shall meet the requirements of page 54 of the "Grand Canyon National Park Architectural Character Guidelines" (attached) unless otherwise approved by Grand Canyon National Park.

VII. Vehicle Headlights

A. Designers of transportation systems should take steps to ensure that unnecessary glare from vehicle headlights does not reach other public areas.

VIII. Review and Approval of Lighting Installations

A. Proposals for the installation of new lighting are subject to review and approval by the National Park Service. Contact Mark Johnston (Grand Canyon National Park) at (928) 638-7906 for review and approval procedures.

IX. Additional Information

A. A valuable source of public information concerning preservation of night skies can be found through the International Dark Sky Association (IDA) (www.darksky.org).

Table 1. Guidelines for Levels of Illumination Based on IES Recommendations, Grand Canyon National Park, 10/02

General: Provide the lowest levels of illumination needed for safety, as recommended by the I.E.S. (Illuminating Engineering Society). Use the table below where applicable. If the table below does apply to a particular condition, provide a recommendation for review and approval by Grand Canyon National Park.

Locations	Minimum (footcandles)	Average (footcandles)	Uniformity Ratio (Average: Minimum)
Roads[1]	0.07	0.4	6:1
Parking[2]	0.13	0.5	4:1
Walkways / bikeways near roads / buildings	0.03	0.2[3]	6:1
Walkways / bikeways distant from roads / buildings	0.17	0.5[4]	6:1
Steps	0.25	1[5]	4:1

Signs: Signs should not be lit except where necessary to provide essential information, and only where the information is needed at night. Where signs are to be lit, provide fully shielded lighting (at the top of the sign), having the minimum illumination necessary to allow the sign to be read. (Use small lighting fixtures only.)

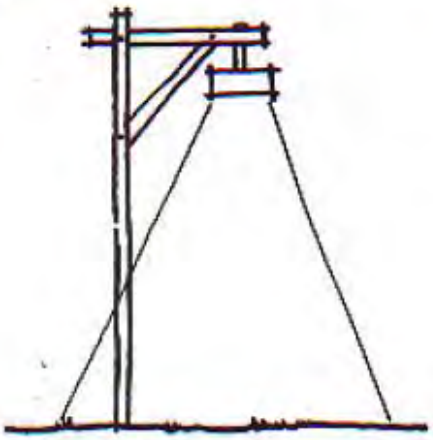
[1] IES recommendation for local, residential roads.
[2] IES recommendation for vehicle use areas having low activity.
[3] IES recommendation for residential areas.
[4] IES recommendation for the locations described.
[5] IES recommendation for commercial area sidewalks.

(FROM PAGE 54 OF "GRAND CANYON NATIONAL PARK ARCHITECTURAL CHARACTER GUIDELINES".)

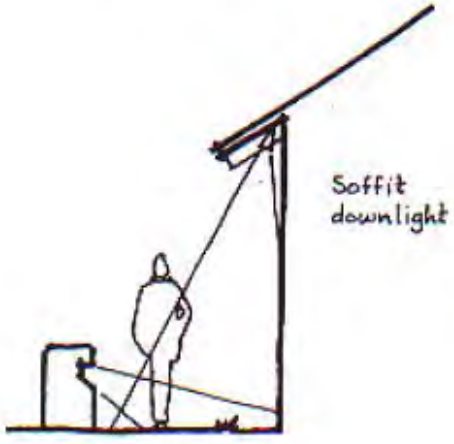
SITE LIGHTING

Light pollution caused by excess reflected light into the sky at or near the Grand Canyon is a serious concern. The introduction of exterior lighting in the Park should be limited to only those areas and cases where human safety requires some level of exterior illumination. Lighting for ornamental purposes is not appropriate.

Lighting should be accomplished with fixtures designed to reflect the principles of rustic architecture wherever possible. Pole-mounted fixtures should be mounted at heights suitable for the intended lighting purpose, and mounting heights should be no higher than that required to accomplish the desired objective. Roadway or parking lot light standards should only be as high as required to accomplish the necessary illumination while being in scale with the surrounding landscape and structures. For example, pole heights could be 25-30 feet in areas where existing tree stands effectively camouflage the poles. Lights located in conjunction with a barren overlook along the rim would only be appropriate if mounted on low standards or poles to minimize intrusion of the structures in the surrounding landscape.



High cut-off downlight



Soffit downlight

Bollard light

Poles and luminaire housings should be finished to blend with other materials consistent with the principles of rustic architecture. Light fixtures illuminating pedestrian walks or plazas should be from 12-15 feet in height in order to be appropriately scaled to the pedestrian and still out of reach of vandals.

Luminaire types should be selected for correctness of color rendition, longevity of lamp life, and low energy requirements. Light should be directed downward onto the ground surface to be lighted to the maximum extent possible, and the cutoff angle and distribution pattern should be carefully considered to achieve effective light levels without visible glare from an exposed light source. Low-level bollard type light fixtures should be considered where they can be effective without becoming too dominant in the landscape. Ornamental luminaries with visible light sources are not acceptable.